

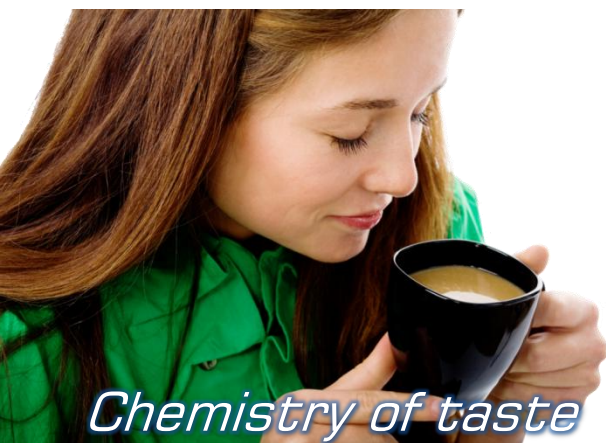
COFFEE

Worlds' Number One Source of Antioxidant

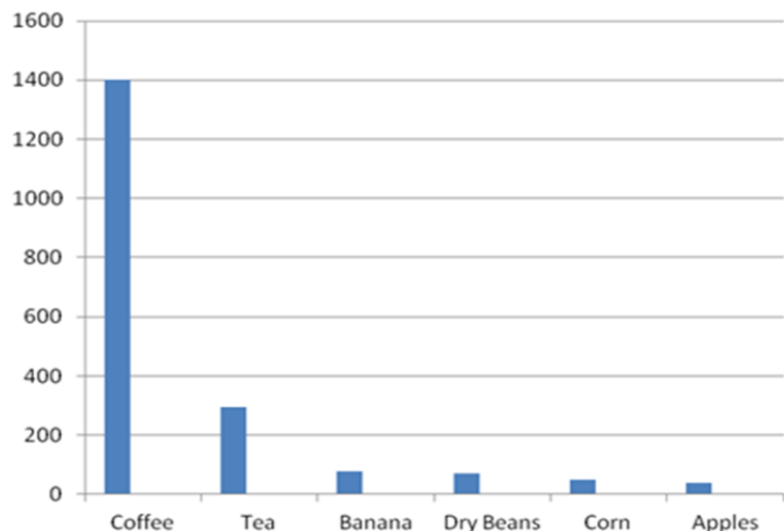
If Calcium and Magnesium are put into the Coffee - "it changes the Coffee"



Helping Coffee flow smoothly



Chemistry of taste with Ca^{2+} & Mg^{2+}



Top ten sources of antioxidants in diets

The Science behind the perfect coffee – it's in the water!

08 June 2014 ([weblink](#))

A chemist at the University has teamed up with the UK Barista Champion to find the best type of water for making coffee. The pair are heading to the World Barista Championships in Italy on 8 June to share their coffee chemistry knowledge with the rest of the world.

Christopher Hendon, a PhD student from our Department of Chemistry, embarked on the project in his spare time with friend Maxwell Colonna-Dashwood, owner of [Colonna and Small's](#) coffee shop in Bath, after a discussion about why the taste of coffee varies so much.

Hendon used computational chemistry methods to look at how different compositions of water affect the extraction of six chemicals that contribute to the flavor of coffee, along with caffeine. The study, published in the [Journal of Agricultural Food Chemistry](#), found that water composition can make a dramatic difference to the taste of coffee made from the same bean.

Hendon explained: "Coffee beans contain hundreds of chemicals; the precise composition depends on the type of bean and how it is roasted. The flavor of the resulting coffee is determined by how much of these chemicals are extracted by the water, which is influenced by roast time, grind, temperature, pressure and brew time.

"We've found that the water composition is key to the proportions of sugars, starches, bases and acids extracted from a particular roast."

The coffee industry uses guidelines on the ideal water for coffee extraction from the Speciality Coffee Association of Europe (SCAE), which measures ionic conductivity to quantify the total dissolved solids, however the researchers found that it was the proportions of these ions that affected the extraction and therefore the taste of the coffee.

Hendon explained: "Hard water is generally considered to be bad for coffee, but we found it was the type of hardness that mattered – while high bicarbonate levels are bad, high **magnesium** ion levels increase the extraction of coffee into water and improve the taste."

The study also found that sodium rich water, such as that produced by water softeners, didn't help the taste of the coffee either.

Hendon added: "There is no one particular perfect composition of water that produces consistently flavorsome extractions from all roasted coffee. But **magnesium**-rich water is better at extracting coffee compounds and the resultant flavor depends on the balance between both the ions in the water and the quantity of bicarbonate present."

Maxwell Colonna-Dashwood, co-author on the paper, said: "Unfortunately most of the time you are limited by the source water available. Water from the tap varies regionally and from day to day depending on how much it rains – the only way you can get consistent quality is to use bottled water, but even then not all waters are the same. "For the Championships we test the local water and then select the roast that is most suitable for that particular water. For example you could use a heavy roast with a soft water as it doesn't extract very much, but with hard water it would extract too much and give a bitter taste, so it would be better to use a lighter roast.

"Traditionally the coffee making industry is most concerned about using water that doesn't scale up their machines. But we argue that more value should be placed on the flavor of the coffee and want to use chemistry to help people make the best coffee they can with the water they have available."

Maxwell Colonna-Dashwood won the UK Barista Championship in April and will represent the UK at the World Championships in Rimini, Italy from 9 June.

The competition takes place over four days, with baristas from 50 countries vying to become World Barista Champion. Each competitor must prepare four espressos, four cappuccinos, and four original signature drinks to exacting standards in a 15-minute performance set to music. Each entry is judged on the taste of beverages served, cleanliness, creativity, technical skill, and overall presentation.

Hendon and Colonna-Dashwood are now planning to share their knowledge on the science behind making the perfect coffee in a book

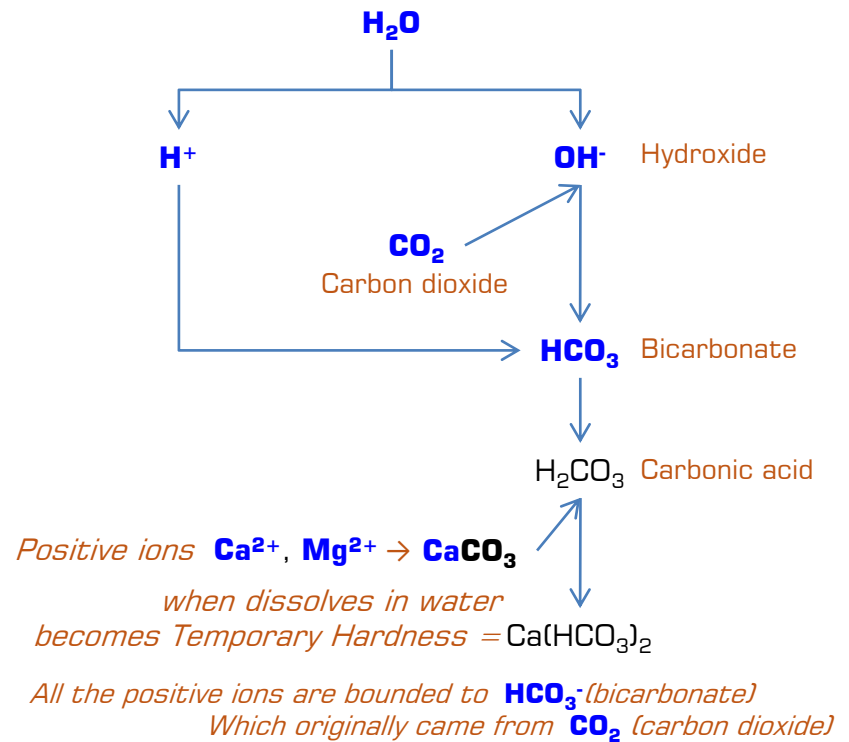
Laboratory News - CHEMISTRY IN THE PERFECT COFFEE

18 March 2015 ([weblink](#))

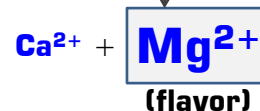
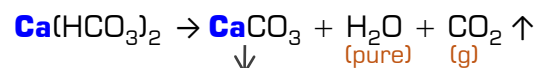
So is the taste of coffee really affected by water?

Most people are familiar with very small quantities of chemicals having catastrophic effects on chemical reactions. Generally speaking, minute quantities of anything in a bulk substance are termed impurities. Water is no different, in bulk water acts like H_2O , but if we look closely, all water contains ions (even water itself auto-ionises to form H^+ and OH^- , this defines the pH scale). But depending on where you are from, and what's in the ground, and how much rain you've had, and how rich in CO_2 the atmosphere is and many more variables, we find that there are low levels of Ca^{2+} , Mg^{2+} and other less pleasant things like UO_2^{2+} . These positive ions can be considered flavor claws. They grab onto molecules in the coffee bean and pull them into the water. However, if you extract for too long, they start to pull out heavier compounds, which are generally cellular breakdown products, and they taste bitter. If the extraction is too short, the coffee only has lightweight compound in the water. All this positive charge has to be countered somehow, and the most familiar counter ion is HCO_3^- , bicarbonate, which originally came from dissolved carbon dioxide. Bicarbonate is amphoteric: it is acidic and basic. It exists in the highest concentration of any naturally occurring ions, and is also the most basic constituent in water besides the trace amounts of OH^- . Its job is to stabilize pH, and it does so by deprotonating acids, and this is a big problem. We hold a nice balanced acidity as one of the most important flavors in coffee, and if there is too much bicarbonate we end up tasting the conjugate bases of the coffee acids and they are bitter.

WATER



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